

OPINION ARTICLE

The Shifting of Ecological Restoration Benchmarks and Their Social Impacts: Digging Deeper into Pleistocene Re-wilding

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Abstract

Current and projected rates of species loss prompt us to look for innovative conservation efforts. One such proposal is that large areas of North America be re-wilded with old world species that descended from Pleistocene mega-fauna. We argue that this approach overlooks many important ecological, evolutionary, cultural, and economic issues and detracts from conservation efforts by adding another arbitrary restoration benchmark. Our objectives are to specifically address the shifting benchmark for ecological restoration, explore the social dimensions of Pleistocene re-wilding, which have been largely overlooked, and discuss why we think Pleistocene re-wilding is not a proactive approach for conservation. This is not intended as a

critique of innovative approaches. Instead it is an argument that human and ecological factors need to be considered in depth before any restoration initiative can be practically implemented. Proactive approaches should consider historical conditions while managing based on the present, should plan for the future, and should allow adaptation to changing conditions. We support the strategy to restore ecological interactions using species that coevolved with these interactions, bearing in mind the complexities of the socio-ecological dimensions of any management action.

Key words: ecological restoration, human dimensions, Pleistocene re-wilding, proxy species, shifting benchmark.

Introduction

Concern for accelerated biodiversity loss prompts us to look for conservation efforts that can be realistically implemented. When the reintroduction approach to conservation is considered, animals such as wolves, black footed ferrets, and bison usually come to mind, but other scholars and scientists are considering something far different: introducing lions, cheetahs, elephants, and camels to North American habitats as part of the Pleistocene re-wilding agenda for conservation.

In 2005, Donlan et al. published a controversial paper in *Nature* proposing that large areas of North America be re-wilded with old world species that descended from Pleistocene mega-fauna. This initiative was justified through ecological, evolutionary, cultural, and economic arguments.

The ecological argument is based on the idea that major changes in ecosystem function and structure occurred circa

13,000 years ago with the human-driven extinction of Pleistocene mega-fauna. Terborgh (2005) and Donlan et al. (2006) argue that such large mammals had disproportionate effects on ecosystem function and processes and that their loss caused a major disturbance that started a series of chain effects at different spatio-temporal scales. The evolutionary argument for Pleistocene re-wilding states that through restoration of ecological roles and functions, evolutionary processes can be reinstated and evolutionary potential and genetic diversity can be preserved. In addition, several species of extant large mammals are currently threatened in their native ranges; bringing imperiled species to North America could be an ex situ conservation tool (Donlan et al. 2005).

We do not intend for this article to be a review of ecological and evolutionary arguments, which are widely available in the literature (Drickamer et al. 2002; Smith 2005; Jaffe 2006; Rubenstein et al. 2006; Caro 2007; Marris 2009). Our objectives are to specifically address the shifting benchmark for ecological restoration, explore the social dimensions of Pleistocene re-wilding, which have been largely overlooked, and discuss why Pleistocene re-wilding may not be a proactive approach for conservation.

Shifting Benchmarks in Ecological Restoration

Conservationists persistently endeavor to re-establish systems as they existed historically. Benchmarks for ecological

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restoration keep shifting and in many cases too much focus is placed on the past. Meanwhile, Earth is currently facing what is described as an unprecedented rate of climate change (MEA 2005). Taking into account changes in physical and climatological characteristics that have occurred in the past and continue to transpire, we believe we have crossed restoration thresholds that we cannot realistically overcome. In addition, an attempt to determine the original state of ecosystems is hypothetical, is based on incomplete information, and ignores evolutionary processes.

It is argued that humans were responsible for Pleistocene extinctions of mega-fauna. The argument is based on the idea proposed by Martin (1966) that such losses were entirely due to human hunting. This “prehistoric overkill” hypothesis has been largely debated (Grayson & Meltzer 2003), and no unequivocal evidence exists to support it, although in recent years there has been an accumulation of scientific evidence in its favor. In recent publications such as *Twilight of the Mammoths*, Martin (2007) describes how large animals vanished in North and South America around the time humans arrived at the end of the last great ice age; in *Guns, Germs and Steel*, Diamond (1997) presents evidence for faunal extinctions on Pacific Islands following colonization by Polynesians; and Prideaux et al. (2009) relate how hunting by aborigines in Australia may have been a decisive factor in the extinction of giant marsupials. Several alternative hypotheses have been proposed, such as the “Climate change,” the “Hyper-disease,” the “Continentality,” and the “Combined human-climate” hypotheses (Koch & Barnosky 2006). However, even if a direct or indirect human-driven extinction of Pleistocene mega-fauna is assumed, the rationale for Pleistocene re-wilding based on a pristine state where humans were not major actors on their environment has no solid foundation. Long before the late Quaternary extinctions of mega-fauna, humans were an integral part of ecosystems and landscapes, and they used, managed, and domesticated their environment in several ways. Hunters kept numbers of prey species such as bison and elk low (Kay & Simmons 2002), gatherers were responsible for seed removal and dispersal, reshaping entire vegetative communities (Head 1996), indigenous people deliberately lit fires to manage vegetation and wildlife (Pyne 1982), shell collectors exerted pressure over coastal and marine resources (Sanger 1996), and nomadic groups influenced several ecosystems and areas throughout the course of the year (Bonte 1996). The paradigm of the pristine as a natural state with limited or nonexistent human intervention alienates human activities by considering them unnatural (Hunter 1996). Restoration initiatives based only on a past pristine state are contradictory, not only in ecological terms but also on anthropological grounds.

When Pleistocene ecosystems are considered the pristine restoration benchmark, and when the greatest influence humans have had through the course of their evolutionary history is argued to be their role in mega-faunal extinctions, there is an implicit assumption that “big things run the world” (Terborgh 1988). This top-down approach to ecosystem processes has been a point of discussion for several years (Wilson

1987) and it overlooks important ecological functions such as decomposition and biotic storage for which we have few, if any, paleontological records. Even so, predators such as the wolf have been proven to have important roles as keystone species within an ecosystem. In Yellowstone National Park, for example, wolves have become key predators after their reintroduction, influencing important ecosystem processes through predator–prey dynamics (Ripple & Larsen 2000). However, not all stakeholders support wolf reintroduction programs even though research and popular opinion generally accept the role of wolves as keystone predators (Kellert et al. 1996). Extrapolating the wolf case to fit our argument of Pleistocene re-wilding, even if nonnative mega-fauna were proven to have a positive effect on North American ecosystem function and processes, stakeholder concerns for livestock, human safety and other community livelihoods must be addressed in the decision-making process if the point of acceptance between wild animals and humans is ever to be reached (Reese 2010).

A central premise of ecological restoration is the delineation of historic reference conditions that are ecologically justifiable (Moore et al. 1999). The ecological justification, however, should go hand-in-hand with the cultural, economic, social, and anthropological justifications, to be reasonable not only in ecological terms but also in terms of time, money, and desired outcomes. If our target is to restore ecological processes, why should we focus on reinstating processes of past eras? By focusing on the past, we overlook the ecological potential of current ecosystems and base the decision-making process on prehistoric ecosystem patterns.

Change occurs at all scales and is triggered by stochastic or deterministic factors, which in turn are affected by the very change they caused in a feedback loop. The interactions of the cultural and natural elements of ecosystems should be considered when trying to understand ecosystem function and landscape change (Marcucci 2000). The dynamic nature of society and humans is closely related to how our perception of the environment changes over time and generations, and this “shifting baseline syndrome” (Pauly 1995) determines human expectations of the outcomes of any restoration project.

In order for mega-fauna reintroductions to work and have the desired effect of reinstating processes of the past, the human component of the system would have to change in parallel with the nonhuman component. This intrinsic nature of complex ecosystems makes the Pleistocene re-wilding proposal difficult to accomplish.

Does Pleistocene Re-wilding Consider Human Dimensions?

Many scholars agree that definitions of “wild” often exclude the human component and create a dichotomy in which humans are a separate entity conflicting with the balance of nature (Bechtel 2006; Paterson 2006; Ereshefsky 2007). Here, we aim to support our critique with specific social issues that deserve more attention and have been overlooked by the Pleistocene re-wilding proposal: the illegal trade of exotic and

endangered species, the burden of Pleistocene re-wilding that would be placed on private landowners, and the exorbitant cost of fencing.

Many African mammals suffer from poaching and the illegal trade of exotic and endangered species. The appendices and policies of the Convention on International Trade in Endangered Species (CITES 2007) attempt to regulate wildlife trade, but the implementation of such policies can be stalled by several issues. African elephant populations, for example, have been severely impacted by poachers who hunt them for their ivory tusks, but political divisions exist between states on how to approach elephant conservation (Abensperg-Traun 2009). It would be counterproductive to introduce the African elephant or any other African mammal to North America, where regulations are not always in place to curb their destruction or illegal trade. In the United States, for example, there is currently no coordinated national strategy, legislative authority, or funding devoted to oversight of the live wildlife trade (Smith 2009). Elephants and other mega-fauna suggested for introduction in North America are classified as endangered species in their native regions and will become extirpated within the century, by some estimates (Donlan et al. 2005). Donlan et al. (2005) suggest that there is an opportunity to preserve these species by removing a few mega-fauna from their native regions, or source countries, and introducing them in North America, but this approach implies that the source countries are not sufficiently conserving their native mega-fauna and will be unable to stop their extirpation. This implication disregards conservation programs already in place in source countries and ignores the challenges that North American conservation programs face with saving their own native species such as the Mexican Gray wolf or the Black footed ferret. The tourism industries of source countries could also suffer financial losses if tourists and hunters, unwilling or unable to travel overseas, could view wildlife and hunt mega-fauna in their own North American backyard. Ecotourism operations are major sources of employment and income for many populations (Balint & Mashinya 2008), as well as catalysts for local communities' participation in resource management (Stronza & Pégas 2008). Re-wilding North America with nonnative mega-fauna is a conservation approach that narrows the focus to potentially beneficial biological solutions and ignores the social and cultural aspects of conservation on local and global scales.

Proponents of Pleistocene re-wilding have suggested that introductions could begin on extensive tracts of private land in economically depressed parts of the Great Plains in North America. Donlan et al. (2006) also suggested that these species could find a new home in "ecological history parks." However, it is unclear which private landowners would agree to harbor free-roaming lions, cheetahs, and elephants on their ranches, or whether the new parks would be private ventures or managed through a federal agency. More protection means more regulations, and "restrictions on land development are frequently met with intense political opposition from landowners who resent having their 'development' options limited and worry about reductions in the market value of their

property" (Jackson-Smith et al. 2005). Outlines defining collaboration between all stakeholders involved should be drafted long before nonnative endangered species and their habitats become the responsibility of North American citizens.

In addition to aesthetic and ethical reasons, proponents of Pleistocene re-wilding suggest that the initiative is justified on economic grounds because the presence of wild beasts roaming the Great Plains might reap monetary benefits for local communities through ecotourism. Farmers and ranchers throughout the Midwest already strive to protect their crops and livestock from North American predators and diseases with vast expanses of fencing, and they would be presented with a greater need to enhance fencing at an enormous cost if African predators were released.

According to Hayward and Kerley (2009), fences are most often used to alleviate human-animal conflict, to reduce human persecution on threatened species, and to reduce the impact of introduced species. If North America is re-wilded with African mega-fauna, thousands of miles of fencing as they stand today could not successfully corral elephants or lions. Fencing is also needed to control disease transmission between wild animals and livestock. Recent outbreaks of bovine tuberculosis, chronic wasting disease, and brucellosis have increased the need for methods such as double fencing to reduce the transmission potential (Karhu & Anderson 2006).

Is the Pleistocene Re-wilding Approach Proactive?

Strategies that consider the complexities involved with ecological requirements of extant species, current and possible future ecological stressors, and the human settings in the areas where they live, are needed. Drastic changes have occurred in the landscape throughout history, which makes managing for the past unrealistic. In order to be proactive, we first need to solve the problems related to habitat requirements of extant species, including humans.

Nonnative invasive species are one of the greatest causes of biodiversity loss. Many introduced species have become established throughout their new ranges and generally have had negative impacts on their habitats. Massive efforts are put in place every year in eradication, containment, and prevention of future infestations (Myers et al. 2000). In our opinion, a more proactive approach would be to prevent potential exotic animal invasions before considering a voluntary introduction of new species.

On the basis of our arguments regarding arbitrary benchmarks, ignored social parameters, and reactive approaches to conservation, we find that Pleistocene re-wilding is flawed. Instead, we agree with the Oliveira-Santos and Fernandez (2009) proposal of restoring ecological interactions using species that coevolved with these interactions. We reiterate the need to restore ecological processes, not patterns, using what we have now, planning for the future, and taking into account the human dimensions of any management action. We need to embrace the complexities of the wildlife-human-environment relationship (Fitzgerald & Stronza 2009) and provide enough

flexibility to allow constant adaptive changes at multiple scales (Gunderson & Holling 2001).

Implications for Practice

- Drastic changes have occurred in the landscape throughout history and unprecedented rates of future change are predicted, which makes managing for the past unrealistic.
- Information from historical data makes it possible to place the present ecosystems and current processes within the appropriate context, but restoration initiatives should focus on the present while planning for the future.
- Human dimensions of any management action need to be considered for successful restoration to take place.
- If the aim is to restore ecological processes through reintroductions, greater focus needs to be placed on species that coevolved instead of using nonnative species, which have an increased potential for unforeseen consequences.

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